

Better Start Before Kindergarten: Computer Technology, Interactive Media and the Education of Preschoolers¹⁾

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Abstract

This article discusses issues of technology, interactive media and preschool education related to the areas of early language and literacy. From discussions with other researchers and practitioners, we suspect that the status, situations, and children's reactions to technology reported on here apply widely across disciplines and curricular areas in early childhood. We focus first on current research related to the role of technology in preschool children's early language and literacy instruction and then discuss what we believe is critically important to address by any preschool or other level of educational institution in order to redress serious shortcomings in the role of technology in the classroom education of today's young children.

Keywords : technology, media, preschool, literacy

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A number of recent policies and practices suggest that the use of technology in the United States' K-12 education has been increasing fairly rapidly. Nevertheless, many U.S. schools still fall behind in technology access and use trends when compared to countries such as Austria, Hong Kong, and Korea (OECD, 2011). State and federal policies and practices suggest that the U.S. K-12 education world is increasingly ramping up technology as central to the experiences of students.

Two recent policy events have placed more emphasis on technology teaching and learning in K-12 education in the U.S. One is the acceptance, by almost all states, of the Common Core State Standards (Council of Chief State School Offices & National Governors Association, 2010) that replace the previous system of individual state standards. The second is most states' use of the standards provided by the International Society for Technology in Education (ISTE). The new Common Core standards are designed to support an education that makes high school graduates "college and career ready." In the area of technology, this means that students will be able to "use technology and digital media strategically and capably," as a consequence of educational experiences that ask students to critique and select appropriate resources, use technology to create presentations and reports, and understand the various strengths and weaknesses of various technologies. In tandem with the Common Core, the ISTE standards focus on having students create, collaborate, communicate, research, and participate in digital society in a meaningful and ethical manner. For example, ISTE standard 4 reads:

Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources. Students: (a) identify and define authentic problems and significant questions for investigation; (b) plan and manage activities to develop a solution or complete a project; (c) collect and analyze data to identify solutions and/or make informed decisions; and (d) use multiple processes and diverse perspectives to explore alternative solutions (ISTE, 2007, n.p.).

In addition to recent policy changes, K-12 U.S. teachers are also integrating communication and networking tools as a support for or extension of student learning. For example, thousands of classrooms are connected through safe, secure email networks and video conferencing tools that allow communication beyond classroom walls (see <http://globalearlyed.wordpress.com/global-tools/tech-tools/>). An increasing number of

teachers use social networking tools like Ning (www.ning.com), Facebook, Twitter, blogs, or ePals (www.ePals.com) to facilitate complex, project-based collaborative work among students in different areas of the United States and across the world.

Even with these recent developments, however, one important sector of American education-preschool-remains far behind K-12 levels of technology access and use. No matter whether one considers technology's role in the classroom, policy related to technology in preschool, or the relationship between children's digital home experiences and school experiences, the topic is virtually absent from current policy and instructional discussions. This lack of attention to issues of technology and young children's learning is a significant shortcoming in the United States, especially given research data indicating that preschool provides a critical foundation not only for later school achievement in a variety of academic areas (DeStefano, Rempert, Innes, & Glaze, 2012; DeStefano, Rempert, Lemons, & Innes, 2012; DeStefano, Rempert, & O'Dell, 2010; U.S. Department of Health and Human Services & Administration for Children and Families, January 2010), but also for life success (Schweinhart, Montie, Xiang, Barnett, Belfield, & Nores, 2005). Moreover, more children than ever before are attending preschool (Barnett & Yarosz, 2007; National Institute for Early Education Research, 2009, 2012).

In this article we discuss issues of technology and preschool education (i.e., 3 through 5 years of age) in the United States from the perspective of the early language and literacy curriculum, although our conversations with other researchers and practitioners lead us to suspect that the same issues apply widely across disciplines in U.S. preschools, and perhaps in other countries, as well. We start by defining technology and interactive media and addressing the concept of two ends of the "technology adoption" continuum. Then, we focus on current research related to the role of technology in preschool children's early language and literacy instruction. We conclude with a discussion of what we believe U.S. preschool education institutions must address if they are to overcome the serious shortcomings in technology use at the present time.

What We Mean by Technology and Interactive Media

In this paper, technology is defined as the use of scientific knowledge to improve the way a

society or culture conducts its work. For interactive media, we use the definition from the NAEYC and Fred Rogers Center position statement on the uses of technology (NAEYC, 2012):

...Interactive media refers to digital and analog materials, including software programs, applications (apps), broadcast and streaming media, some children’s television programming, e-books, the Internet, and other forms of content designed to facilitate active and creative use by young children and to encourage social engagement with other children and adults (p.1).

In this respect, any innovation within a current historical context (e.g., a pencil, a digital camera, a solar panel) is a by-product of one’s thinking through a problem and coming up with an efficient way to solve it. Digital literacy involves locating, organizing, understanding, evaluating, and creating information using digital technologies. Digitally literate people can communicate widely with ease and even work more efficiently (Baker & Coiro, 2011; Coiro, 2011; Tien & Fu, 2008), especially with others who possess similar knowledge and skills. Preschool teachers, parents, and students have a range of “problems” that require “solving.” Many of the new technologies available can assist.

For example, there is the “problem” of differences in the kinds of life experiences students from lower SES come to school with compared to those of preschoolers from higher SES statuses (e.g., Hart & Risley, 1995; Heath, 1983; Moats, 2001; Neuman, 1999). Lower SES preschoolers generally have a narrower range of experiences with oral language, vocabulary, and accordingly exhibit less content knowledge, associated with lower achievement on later measures of reading comprehension (National Early Literacy Panel, 2008). Field trips are one way that teachers build content knowledge. Budget tightening in the U.S. limits the number of field trips a preschool can organize. Technological innovations and interactive media can help support and sometimes accelerate low SES preschoolers’ content-area and language and literacy development through the use of e-field trips (as demonstrated in the primary grades by Blachowicz & Obrochta, 2005), additional experiences with text (e.g., Verhallen & Bus, 2010; Smeets & Bus, 2012), or demonstrations and experiments that provide preschoolers opportunities to apply content knowledge through guided exploration and discussion (e.g., exploring and discussing symmetry through an app like *Snowflake Station* (Mrs. Judd’s Games, LLC)).

In addition, another “problem” in preschools is a dearth of opportunity for authentic communication with an audience beyond the walls of the classroom. This is, in part, a consequence of literacy development and in part a consequence of the student-to-teacher ratios in early childhood classrooms. Young preschoolers typically do not conventionally spell words out on paper. Rather, their composition process is primarily visual (see, e.g., Kress, 2000) and spoken (e.g., Schickedanz, 2012). Preschool teachers typically take dictations of children’s compositions and inscribe their messages for them. Screen capture and dictation technologies (e.g., applications like *Show Me* or *Educreations*) allow a child to capture the oral language part of a composition which could then be shared with family and friends outside of school. This could be especially useful where family members are separated by distance (e.g., immigrant or military families). In addition, virtual visits could allow parents to connect to classrooms for short periods of time during their break time at work (e.g., a parent uses web conferencing software like Skype to conduct the read aloud on their child’s birthday when the parent does not have leave time from work).

A Continuum of Technology Adoption for Preschool Educators

A continuum seems to exist with respect to childhood professionals’ stances toward technology adoption. At one end are educators who are already employing technologies such as those described in the previous paragraphs. At the other end of the technology adoption continuum are those who are reluctant to even start discussing technology and interactive media as viable tools for engaging preschoolers in learning.

The differences of opinion among preschool educators about technology and interactive media use probably stem from deeply rooted philosophical traditions in early childhood education that have informed curriculum and instruction for a long time. For example, preschool educators have long been committed to providing concrete, exploratory learning (e.g, hands-on, using real materials that children manipulate directly). In addition, a bedrock of early childhood educational philosophy is the importance of relationships as the foundation for learning, both between children and between adults and children. Many preschool educators justify their reluctance to use computers and interactive media because such technologies seem to violate these two traditional tenants of preschool education.

Technology, Interactive Media, and Preschool Children: What We Know

Just as print evolved to become an indispensable part of people's social/intellectual toolkit, computer technology has become central to how people in literate societies organize their social and intellectual activities. Of course, change has occurred much faster with computers than it did with common people learning to read print. The widespread availability of printed materials and the masses learning to read took place over centuries, while the prevalence of cell phones and tablets have made technology's expansion into society more accessible to a wide range of the population in a much shorter period. Moreover, just as it is now widely recognized that literacy learning begins in earnest in early childhood (e.g., Teale & Sulzby, 1986), so are we realizing that a parallel phenomenon exists with emergent digital literacy (Davidson, 2012; Labbo, 2009; Wohlwend, 2009). Thus, children now need a level of technological competence in order to interpret multimodal texts and access interactive and digital texts housed on the Internet or mobile devices.

Research has shown that their learning about digital tools (e.g., tablets; computers; keyboards and mice; navigation through interactive media with zooms, scrolling and page turning; the arrangement of information digitally) can begin at an early age in cases where children's environments allow them to explore and gain familiarity with such tools (Labbo, 1996; Roskos, Burstein, You, Brueck, & O'Brien, 2011). In addition, supervised and scaffolded interaction with digital tools can provide children with the fundamental understandings of the why's and wherefore's of digital literacy (Labbo, 2009; Turbill, 2001).

Although research has shown mixed results when computers and other digital technologies are used for early language and literacy instruction, individual studies (e.g., de Jong & Bus, 2003, 2004; Korat & Shamir, 2007; Verhallen & Bus, 2010) and reviews conducted by the What Works Clearinghouse (<http://ies.ed.gov/ncee/wwc/reports/topic.aspx?tid=13>) have indicated that certain foundational aspects of early literacy learning (i.e., phonological processing, print awareness, alphabetic principle, vocabulary knowledge, oral language) can be positively impacted by digital experiences.

Technology and Young Children: In Classrooms, Policies, and Research

The following sections present what the field of early childhood education knows about the use of technology and interactive media with young children. Research evidence is not particularly robust, but we have indications from three relevant areas. We first focus on empirical research that describes the role of technology in preschool classrooms. We then discuss policy efforts to incorporate or exclude technology from preschool educational contexts. Our review of the research concludes with a presentation of data comparing technology and media in home- and school-contexts.

Technology's Use in the Classroom

Although technology is present in many U. S. preschools, students' access in this setting has not kept pace with access found at other grade levels of education (Grunwald Associates, 2010). For example, preschool teachers are less likely to use digital media in their classrooms than kindergarten through 12th grade teachers (33% compared to 75%). This difference is probably due largely to the lower rates of Internet connectivity in preschool classrooms compared to that in K-12 classrooms. For example, while only 36% of preschool teachers had Internet access in their classrooms in 2010, 93% of K-12 teachers reported having Internet connectivity in their rooms.

For the past seven years, the authors have been involved in the implementation of three Early Reading First (ERF) projects with preschool classrooms in Chicago area schools. The purpose of these projects is to create early literacy centers of excellence (see <http://www.uic.edu/educ/erf/>). During the third year of one ERF project, a significant portion (3 days of 10) of our professional development for the project's classroom teachers focused on helping them integrate technology into their classrooms. Analyses of these teachers' use of technology were conducted both before and after the professional development intervention, using the Early Language and Literacy Classroom Observation (ELLCO, Smith, Brady & Anastopoulos, 2008; Smith & Dickinson, 2002) and teacher interviews.

The Before observations/interviews indicated very limited use of technology. For example, only 2 classrooms (of 5 surveyed) had computers available to children. In only one classroom

were children permitted to be engaged with technology on a regular basis, and that involved an online site focused on reinforcing foundational literacy skills. And, interestingly, the only teacher-reported use of the computer was email. No teachers mentioned any use of peripheral technologies such as still or video cameras.

The After intervention observations and interviews indicated significant and positive changes in technology access and use in all the intervention classrooms. Interview data also revealed that all students had access to the computers and every teacher adopted “easy” technologies in her classroom, teaching students to use the Internet for *One More Story*, *Starfall*, and *PBS Kids*. Three teachers who were more skilled with technology than the other two teachers also integrated digital cameras to facilitate the building of the children’s background knowledge, to document classroom events, and to prompt children’s guided or independent writing projects. These findings indicated that, with appropriate professional development and funding for the technology (e.g., computers, cameras, software, printers), preschool teachers can integrate technology into their classrooms for appropriate instructional purposes.

A second study of technology use in preschool classrooms showed the importance of teacher training in specific uses of technology, and indicated that frequent engagement of the children in using technology for specific instructional goals can provide additional exposure to, and even noticeable benefits for, language and literacy. Young children may assume that the purpose of computers is merely to play games unless they have exposure to and interaction with appropriate computer-based early reading and writing activities such as digital story listening/read alouds, composing opportunities (e.g. digital storytelling, digital Language Experience Approach), or even phonological awareness activities.

Paciga (2011) collected research data centered on preschool children’s understanding of digital storybooks in two school districts (A and B). Five demographically comparable classrooms from each district participated in the study. The two districts were selected because they served large numbers of students from low-income homes. Their racial composition was more than 80% African American and two classrooms in each district were funded by federal Head Start dollars. The research activity was carried out over 3 days. On the first day, children were informally observed in their classroom context on computers during center time. On the second day, children interacted with a website to demonstrate

competency in clicking, scrolling, and turning pages. On the final day each child listened to as much of a digital story as he or she was willing. When the child either completed the story or declared he or she was finished (i.e., abandoned the activity), he or she participated in a comprehension activity to determine how much of the story was understood.

District A preschool teachers had received training in the use of specific technology to engage children regularly in high-quality children's literature available on the Internet (e.g., www.onemorestory.com) and had engaged their children regularly in digital story listening activities during centers and small group time prior to the data collection process in the Paciga (2011) study. In addition, the children in District A used digital interactive media such as KidPix, Arthur's Preschool, as well as educational games available on websites (e.g., www.pbskids.org). District B teachers had little knowledge of or experience with digital storybooks, and the only computer activities children were observed completing over a two-month period were a Sesame Street CD-ROM game and a game on the PBS Kids site. In District A, 18% of the children abandoned the listening activity before the end whereas a significantly higher 33% did so in District B. Those who abandoned the activity scored much lower on all story-understanding measures.

Although a cause/effect chain cannot be drawn because of the design of the research, these differences suggested *something* importantly different between the two groups of children with respect to their engagement in digital story listening activities. We did not ask a child to tell us why he or she chose to abandon the story-listening activity (i.e., stop listening to the story), but our experiences with the children suggest the following explanations: (a) the child could not manipulate the technology; (b) the child was not interested in the story's content; (c) the child was insecure with a stranger; or (d) the activity endured longer than the child desired.

The ERF and Paciga (2011) studies clearly indicate that preschool children can engage in developmentally appropriate ways with computers in their classrooms. Other research with preschoolers, which has focused on technology-supported or technology-integrated activities describe preschoolers successfully and meaningfully engaging in activities such as utilizing computer support for composing (i.e., writing their ideas) (Merchant, 2005; Moxley & Warash, 1997), engaging in dramatic play with technology devices (Merchant, 2005; Wohlwend, 2009), and practicing writing familiar words (e.g., children's names and the names of favorite book characters). In addition, we have found in our own observations that

both preschool and kindergarten children can blog and even participate in global education collaborative groups (see <http://kidblog.org/MrFlinnsClass/> and <http://margaret-powers.com/tech-for-a-global-ece/>, respectively).

Policy Related to Technology in Preschool

Federally funded Head Start Early Learning Standards (USDHHS, 2010) now encourage the use of assistive technologies and recognize technology as a means for teachers to gather information, download instructional materials, and assist preschool children in observing scientific phenomenon. We think, however, that the application of technology for learning only in a singular domain (e.g., science) will not help preschoolers develop foundational skills in using technology that match the broad uses stipulated in the CCSS for students in K-12th grade.

Although the federal government has provided considerable funding for media, the funding for early childhood education (i.e., preschool, kindergarten, and early primary grades) tends to be television-based. Perhaps this is because of the comparatively longer research track record related to the benefits of educational television such as *Sesame Street*, *Super Why*, *Word World* and *Between the Lions* for young children (Fisch, 2004; Linebarger, 2001; Linebarger & Walker, 2005) than that for computer-based interactive technologies. Now, of course, programs such as these have links to corresponding Internet resources (e.g., www.pbskids.com). These programs continue to be a major international means of promoting early language and literacy.

In addition to the U.S. federal government's policy of funding programs with Internet links to support early education, technology use with young children has received more support recently from the revised position statement on technology use in early childhood issued by the National Association for the Education of Young Children (NAEYC; see <http://www.naeyc.org/content/technology-and-young-children>). This position statement's 16 principles recognize the role that technologies play in modern-day communication. These principles are intended "to guide the appropriate use of technology and interactive media as tools in early childhood programs serving children from birth through age 8" (National Association for the Education of Young Children & Fred Rogers Center for Early Learning

and Children's Media at Saint Vincent College, 2012, p.5). In addition to the revised NAEYC policy on technology use and interactive media with young children, the influential Joan Ganz Cooney Center (JGCC; <http://www.joanganzcooneycenter.org/>) has incorporated the examination of computer and mobile technologies, and interactive media in its research agenda (e.g., Chiong, Ree, Takeuchi & Ericson, 2012; Takeuchi & Stevens, 2011; Vaala, & Takeuchi, 2012). The JGCC's Quick Reports (Chiong, et al., 2012; Vaala & Takeuchi, 2012), in particular, have presented case study and descriptive data that illustrate the differences in how adults support young children's use of interactive media.

There are also some promising new policy efforts at the state level with respect to revisions of early learning standards (i.e., stipulations of what preschool children should know and be able to do). For example, revised preschool standards in Massachusetts and New York now include the words "technology" and/or "computer" multiple times. The Massachusetts document recognizes that "digital tools are used for communication and, with support and guidance, [children] use them to convey messages in pictures and/or words" (2011, p.24), and New York recently added an entire section of technology benchmarks to its early learning standards (2011). Moreover, in the New York early learning standards, technology is broadly conceptualized and includes many excellent indicators of a technologically adept preschooler. A child who meets these standards would be able to:

- View and explore a diverse range of technologies and media;
- Identify examples of technology and the functions of certain tools;
- Describe the ways technology has impacted our world;
- Explain how technological systems are used (e.g., Internet);
- Apply appropriate vocabulary to describe technological tools and devices; and
- Use a variety of technological tools and devices for a variety of purposes.

In addition to these recent policy developments relating to early education-including education at the preschool level-technological tools such as tablets, digital cameras, printers, and scanners are now designed for easier use by young children, and are also more affordable. Thus, these technological tools have rightly earned a place in some federal and state policies regarding preschoolers' use of technology. However, when one observes in preschool

classrooms (as the authors do frequently) and talks with preschool educators, little influence of these policies is often seen. This is especially true in preschool classrooms in urban (i.e., low income) areas, where classrooms look and feel like they have not been touched by these policies.

The disparity between preschool urban and suburban technology access and use is well documented in a recent research report published by Common Sense Media (2011). This report indicates “three out of four (72%) 0- to 8-year- olds have a computer at home, but access ranges from 48% among those from low-income families (less than \$30,000 a year) to 91% among higher-income families (more than \$75,000 a year)” (p.20). Moreover, the disparity in desktop computing carries over to mobile devices with smartphone access ranges from 27% of lower-income children to 57% of those from families earning \$75,000 a year or more.

A Comparison Between Preschoolers’ Digital Experiences in Home and School Contexts

Several research studies indicate that children aged six months to six years have access to and use computers. A national survey of computer access and use in the United States (Calvert, Rideout, Woolard, Barr, & Strouse, 2005) showed that most parents reported children spent the majority of computer time playing games, but also indicated that non-game computer use was associated with a higher probability of parents reporting that their young child could read. In addition, Calvert and colleagues found that nearly 75% of families surveyed had a computer in their house, and that 88% of those families had Internet access. Parents reported that 58% of preschool aged children had used a computer. Similar patterns were found in a survey conducted in the United Kingdom (Plowman, McPake, & Stephen, 2010). Regardless of socio-economic status or how much technology was available in the homes, 91% of the families felt that the Internet would play an important role in their children’s education and that exploring the computer during their preschool years would help prepare the children for the future.

Although the Calvert et al. study indicates that the majority U.S. families have a computer and Internet access (75% and 85%, respectively), the reported use level of computers by preschoolers (58%) suggests that parents may be somewhat reluctant to give their

preschoolers computer access. Perhaps this reluctance is due to the recommendations put forth by the American Academy of Pediatrics. They wisely recommend that parents *limit* their children's daily on-screen time (www.aap.org/advocacy/mmgguide.pdf - 2010-05-26), but it does not suggest in any way that computers (and television media) are or will ever be the demise of children. Of course, because anything associated with more sedentary lifestyles can put children at-risk for certain health issues, it is revealing that parents tend to be more aware of the potential harm of technology than its potential benefits. Potential benefits include global social interaction, increased access to information, and support for creating multimedia compositions. For teachers, technology increases their capacity to individualize instruction and to assess and follow students' learning over time, and to develop appropriate instruction than emanates from assessment data collection.

What Would Help in Moving Forward on Technology for Learning in Preschool?

Without additional technology in classrooms, funding for research, and support for teachers, this gulf will continue to widen. Four steps, if taken, could increase technology use at the preschool level and thus help preschoolers build adequate foundational knowledge for later school and life success.

First, preschool classrooms need much greater access to technology. The current level of low access is probably related to the fact that preschool classrooms in U.S. public schools are considered mere "appendages" to the elementary school and, therefore, do not receive the same consideration when it comes to funding for computers, tablets, Internet access, digital cameras, and other new media and technologies now available to older children (Grunwald Associates, 2010). Moreover, preschool programs offered outside of public schools often serve lower income populations where funding for materials and equipment is often very limited. Federal- and state-funded preschool programs may need to allocate funding specifically to improve access to technology. These improvements would be necessary in school contexts as well as in some out-of-school contexts. We suggest this because public

library hours in lower-income, urban neighborhoods are restricted and often provide fewer resources per patron (Neuman, 1999).

Although funding such digital resources can be challenging in the current U.S. economy, both public school and community-based preschools can take advantage of community resources (e.g., computers donated by area businesses, hand-me-down smartphones). Additionally, when preschools are part of the public school system, administrators need to be sure to make the preschool acquisitions part of the school or district technology plan, rather than limit these plans to the K-12 grade levels, as typically happens currently.

Second, in addition to increasing access to technology in preschool classrooms, professional development must be provided to preschool teachers. Otherwise, new tools are likely to be underutilized, poorly integrated, or used by children to play games that may have little instructional merit. Professional development opportunities must be robust, not merely a quick introduction and survey of new technologies (e.g., <http://www.teccenter.erikson.edu/>). The vast majority of preschool teachers need and typically welcome systematic, on-going opportunities to explore new digital technologies in order to come to view them not as a replacement for teaching or as a technological system to be learned, but instead as a tool to embed into all areas of the existing curriculum.

Our third recommendation emanates from the perception that technology is viewed as a skill in and of itself, not as a means to improving children language and literacy learning. Most states, like Massachusetts and New York (above), have presented the standards as their own self-contained area of learning (media or information technologies or technology standards, for example). To help recast the ECE perspective on technology use for skill acquisition, we recommend that PD be designed to help teachers learn how to use these new technologies and interactive media as tools that illustrate concepts, or facilitate acquisition or application of content area knowledge. A preschool teacher could view a segment of *Sesame Street's* Grover as a waiter on a windy day (<http://www.youtube.com/watch?v=M6Ap8bIvrvY>) as a way to help introduce a unit on wind and water before they explore real objects (e.g., cotton ball, paper clip, rock, jelly bean) with a fan or hair dryer. A digital camera could document the children's explorations. The photos could then become the foundation for a shared writing activity in which the preschoolers write the text and share it with parents via email or through a private networking site. In this way, teachers could begin to see technology

and interactive media as central to learning in language arts, mathematics, science, the arts, social studies, health and physical education, and social-emotional development.

We have no doubt that such an approach can have lasting impact on a large number of preschool teachers. Our experience working with Early Reading First projects has been that focused, sustained professional development changes teachers' practices and facilitates the use of technology in their preschool classrooms in positive ways. Through ERF we witnessed the use of interactive media and technology to support art, music, health, science, social studies, and math content learning. Children's technical vocabulary and content knowledge in our intervention groups grew and supported their comprehension of both stories and informational text.

Summary and Conclusions

As technology becomes more prevalent in children's home and classroom lives in elementary, middle and high schools, preschool students are being left behind. The steps we have offered for improving how and why preschool students access and use technology and new media in the classroom would likely improve the present situation considerably. Increasing access, funding, and support for new technology (i.e., hardware) and interactive media (i.e., software) for preschool classrooms could have tremendous and positive impacts, especially in lower-income and urban schools.

Integrating technology and incorporating interactive media across the curriculum in two ways—(1) from preschool throughout students' educational careers and (2) across subject areas—will prepare students for their futures. In these ways, the curriculum will serve the dual purposes of supporting language and literacy development *and* helping students build content-area and background knowledge while employing technology as a tool for learning and communicating.

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